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Measuring Organizational Factors in Airline Safety

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Abstract

In recent years, there have been several major transportation accidents which have brought significant attention to the role that organizational factors play in motivating operator safety within high-risk systems, yet very little has been studied regarding the direct contribution organizational factors play in accidents. The purpose of this study is to elucidate the types of organizational factors associated with accidents that were attributed principally to "pilot error." Specifically, we provide case-based analyses of commercial accidents with organizational cause factors from the ten-year period encompassing 1990-2000. Results indicate that inadequacies in procedures and directives rank among the highest organizational problems for both large and small airlines alike. However for small airlines, training, surveillance and supervision also tend to be a large problem, in addition to procedural issues. As airlines grow larger, organizational problems appear to shift from issues of training and surveillance to issues of information sharing and documentation. These findings suggest that while smaller airlines may need to be aware of larger operational oversight issues, larger airlines may need to concentrate on issues of operational consistency.

Introduction

Several major accidents during the late Twentieth Century brought significant attention to the role that organizational factors play in motivating safety within high-risk systems. One of the first instances was the nuclear accident at Chernobyl in 1986, in which the International Atomic Energy Agency identified a "poor safety culture" as a factor contributing to the Chernobyl disaster (IAEA, 1986, as cited in Cox & Flin, 1998; Pidgeon, 1998). Since then, organizational factors have been discussed in other major accident enquiries and analysis of system failures, such as the King's Cross underground fire in London and the Piper Alpha oil platform explosion in the North Sea (Cox & Flin, 1998; Pidgeon, 1998) and in several high profile aviation/aerospace accidents such as the Challenger disaster (Vaughan, 1996). Within commercial aviation the turning point for the analysis of organizational factors came with the in-flight structural breakup and crash of Continental Express Flight 2574 near Eagle Lakes, Texas, on September 11, 1991 (Meshkati, 1997). The National Transportation Safety Board (NTSB) suggested that the probable cause of this accident included, "The failure of Continental Express management to establish a corporate culture which encouraged and enforced adherence to approved maintenance and quality assurance procedures" (NTSB/AAR-92/04, 1992:54). Since then, the focus on organizational factors in aviation and other aerospace accidents has continued to grow, culminating with the recent scathing analysis of the organizational failures within NASA that contributed to the Columbia Space Shuttle tragedy (CAIB, 2003).

By tracing cause factors back to the organizational level, there is a chance for remediation through identifying factors that can be corrected to produce a more error tolerant system, and perhaps produce a positive change in the organization's view of safety. Weick (1985) notes, when quoting the classic work by Peters and Waterman (1982:29), "Good managers make meanings for people, as well as money", and currently there is no shortage of attention to money. It is regrettable the same cannot be said of attention to safety. While proactive measures to guard against financial loss take top priority, it is usually only after significant injury or death that safety is considered top focus. Organizations that approach safety as a top priority build in adaptability and coping mechanisms in the face of adversity (Perrow, 1986; Weick, 1987; Reason, 1997; Eiff, 1999; Wiegmann, et.al., 2004). Organizational and operational susceptibility to failure is therefore, reduced when encountering impending hazards. This, in short, is why a focus on organizational safety is so important.

Admittedly, the role that organizations play in etiology of accidents was recognized prior to these recent accidents previously mentioned. For example, March and Simon (1958) in their seminal work *Organizations*, describe organizations as complex systems that fail more often due to administrative factors than to operator (worker) behavior. In fact Bird's (1974) Domino Theory fundamentally traces the root causes of all accidents to failures in organizational loss control and has been a standard model of accident causation within manufacturing and industrial settings for decades. More recent theories of organizational accidents build on these foundations, including works by Reason (1990), Weick and Roberts (1993), Klein, Bigley and Roberts (1995), and

Zhuravlyov (1997).

Notwithstanding the vast array of accident causation theories and the heightened attention that organizational accidents have recently received, very little is actually known about the types of organizational factors that directly contribute to accidents. In contrast, there is a growing body of knowledge concerning the role that aircrew error plays in the etiology of accidents, with estimates of up to 80% of all accidents being caused by the unsafe acts of pilots (Dismukes, Young & Sumwalt, 1999). This discrepancy in our understanding of organizational factors is not surprising given the fact that a pilots' actions are more easily tied to the occurrence of an accident, whereas organizational factors are generally far removed temporally from the event, making them difficult to link to an accident during an investigation (Wiegmann & Shappell, 2001). Furthermore, investigators are often highly knowledgeable of the tasks and duties of the accident aircrew that may have gone awry, but are generally uninformed as to the types of organizational issues that they should specifically examine during an investigation.

Consequently, some have argued that despite a growing awareness of the importance of organizational factors, they are still often overlooked or unidentified by aviation accident investigators in the field (Heinrich, Peterson, & Roos, 1980; Yacavone, 1993; Maurino, Reason, Johnston, & Lee, 1995). The modus operandi of most field investigators continues to be "pin the tail on the pilot," referring to "the pilot's" erroneous actions or decision, with little indication of contributing factors up the organizational chain. Nonetheless, there are cases in which "pilot error" accidents have been thoroughly investigated. Generally, these thorough investigations have occurred because of the magnitude, severity and high profile nature of the accident. It is common knowledge that accidents involving death or significant financial loss receive a more in-depth investigation than do minor incidents. A thorough review of these accidents therefore may lead to a better understanding of the organizational factors that contribute to accidents in general and hence provide knowledge about how to prevent them from happening again. Albeit, the organizational factors associated with major accidents may not be representative of those involved in minor incidents, they do at least provide some insight into the factors that are known to have a major impact on operational safety.

The purpose of the present study, therefore, is to further elucidate the role organizational factors play in aviation accidents by performing a comprehensive analysis of U.S. commercial aviation accidents that were primarily attributed to "pilot error" but also had organizational roots. To accomplish our objective, we first provide a detailed analysis of two case studies to illustrate in detail the role that organizational factors can play in "pilot error" accidents. We then provide a statistical and descriptive analysis of organizational factors associated with 60 commercial aviation accidents for the ten-year period from January 1990 through January 2000. Finally, we summarize the insights and implications gleaned from this endeavor.

Case Studies

Case 1: Controlled Collision with Terrain, GP Express Airlines, Inc., Flight 861

On June 8, 1992, at 8:52 AM CDT, a GP Express Airlines, Beechcraft 699, crashed while on approach to Anniston Metropolitan Airport in Alabama (NTSB, 1993). The accident occurred on the second leg of the scheduled sequence of operation. The aircraft was destroyed by the impact and subsequent fire. There were three fatalities, including the captain, and three serious injuries resulting from this accident. This accident occurred on the first day of duty for both members of the flightcrew in the airline's new southern routes, which was only the third day of operations for the airline in this route structure. This was the captain's first duty day with the airline and his first job as an airline pilot. The first officer had been flying with the company for only one month. The crew had never flown together prior to this day, and neither had flown on the assigned flight route.

The flight was on an Instrument Flight Rules (IFR) flight plan. Nearing arrival, the crew lost awareness of the aircraft's position. Both pilots erroneously believed they were to the south of the airport, when in fact they were north of the airport. They also believed that Air Traffic Control (ATC) was providing the flight with radar services, but in fact ATC was not. The flight's radar services had been terminated earlier, a message that was noted on the flight's voice recorder, but was not validated by the crew, which may mean they did not hear it. Also, the flight was operating in a non-radar controlled environment, which means ATC could not "see" what was the disposition of the aircraft on its radar scope.

The crew began the approach into Anniston Metropolitan airport from an excessively high altitude, at a high airspeed, without performing the required procedure specified on the published instrument approach chart. The crew did not brief the procedure before undertaking it. In addition to this, there was only one approach plate (chart) available for the crew, which was in use by the first officer, who was not the flying pilot. As a result of this, the captain, through inexperience and disorientation, became overly reliant on the first officer, who was providing incorrect information. After a series of maneuvers in which the crew called their position into question numerous times, the crew turned the airplane to the north to execute what they believed was the approach to Runway 5. Instead, they intercepted what is known as the back course localizer signal, and followed this away from the airport until the aircraft impacted the ground. A localizer is a signal that radiates outward from the approach end of the runway, along the virtual extended centerline of the runway. A back course localizer is a by-product of this signal that radiates in the reverse direction. This can also be used for an instrument approach, but the approach is run backwards, meaning that, contrary to a normal approach, right is left and left is right on the instruments.

While factors in this accident point to problems with inadequate crew coordination and authority over the duration of the flight, what is interesting upon review of this accident are factors involving the organization's management of pilots and training, and how these organizational factors ultimately contributed to pilot error in this accident. Organizational safety issues involving

airline operations include the importance of preparation, training, and experience for newly hired captains, availability of information (approach charts) for each pilot, and a published policy on stabilized approach criteria.

The captain was a former military helicopter pilot, who until hired by GP express, had been working as a general aviation flight instructor. The captain received his initial training from Flight Safety International (FSI) in January 1992, which placed him on a list of qualified candidates awaiting airline interviews. Due to his qualifications, he was hired as a captain by GP Express on May 31, 1992, contrary to their usual practice of hiring only first officers and moving senior first officers to the rank of captain. During his training with FSI, he had been specifically reprimanded for not listening to or using the first officer as a resource. This, along with the workload factors, inexperience in the position, and lack of an approach plate, may have lead the captain to become overly reliant on the first officer, thus all but changing roles with him. His first scheduled flight was to have been June 9th, with the regional chief pilot acting as the first officer. However, due to maintenance problems and the shuffling of resources, it was decided collectively between the regional chief pilot, the crew scheduler, and the president of GP Express to have the captain fly on June 8th, without the benefit of the chief pilot. No one asked the new captain how he felt about this, and he did indeed have reservations about the flight.

GP Express hired the first officer in August of 1991 after successfully completing 50 hours of GP Express' ground training. He was furloughed shortly thereafter until April 30, 1992. After returning to active duty, all of the first officer's flights were conducted on the airline's midwest routes. The first officer was scheduled to have flown the flights on June 8th with the regional chief pilot acting as captain. Due to the aforementioned resource shuffling, the first officer was paired with the accident captain on the June 8th flights. The night before the flight, the captain phoned the first officer to discuss his concern about the assignment since both were new to the southern operation.

GP Express had grown from a small on-demand charter operation into a larger scheduled operation with routes across the midwest. The top management of this company was made up of a mixture of varied experience, including the founder and CEO, a newly hired president, a director of operations with extensive experience in major air carrier operations, and a chief pilot with extensive experience in the airline's midwest operations. The FAA awarded GP Express a contract to increase their route structure on March 26, 1992. They began servicing their new routes in the south on June 6, 1992. The director of operations had originally proposed to supply each pilot with a set of approach charts and five days for route familiarization/qualification experience prior to starting service in the southern region. This was rejected by the CEO and then president of GP Express as unnecessary stating, "When pilots fly a charter, they do not perform a dry run" and that experience on their existing routes provided sufficient line operations experience (NTSB, 1993:24). Clearly, this decision aided the undoing of flight 861.

Table 1. Organizational factors for Flight 861.

Crew	Both newly hired. No previous experience on the route of flight. Limited (or no) experience in airline flying. Role reversal of captain and first officer.
Captain	No commuter air carrier experience. Hired as captain, not first officer. Low time. First flight ever as an airline pilot. First flight ever as a captain. First unsupervised revenue flight.
First officer	Low time. Known previous deficiencies with instrument approaches.
Cockpit	New intercom system (background interference, noisy). Only one set of approach plates.
Training/Information	CRM training consisted of a handout for home study. Airline flight manuals provided no information on stabilized approach criteria, which would provide parameters for a missed approach.
GP Express	Mixed management styles. Expanding operations without full preparedness. Inadequate crew training and scheduling.

Table 1 illustrates the organizational factors contributing to the GP Express accident. While no one can state with absolute certainty what an outcome would be had organizational factors been different, evidence cited in the NTSB report indicates that had even one factor been changed, the outcome may have been the safe completion of the flight. Presumably, had either of the pilots had even one flight on the new routes, there would have been a familiarity with the procedures and perhaps they would have understood they were not receiving radar services. Had each pilot possessed a set of approach plates, perhaps the error in the first officer's calculations would have been noticed, but with the absence of that information, the captain had to rely on the information he received.

The most noticeable factor about this case is the lack of employee empowerment. While it can be understood that the new pilots would be loathe to refuse an assignment or state to superiors that they were unsure about the safety of the operation, especially given the factors surrounding this accident, it is clear the apprehension of the crew before the assignment should not have been unforeseen. The director of operations had been rebuffed when trying to establish a procedure for training and safety on the new routes, thus the standard for the new route structure was accepted as no training; if they are pilots, they should be ready. Therefore the collective decision between the regional chief pilot, the crew scheduler, and the president of GP Express to schedule the inexperienced crew did not raise any suspicion. The pilots were not asked beforehand how they felt about the assignment, nor did the chief pilot offer to brief them on the assignment since they

would be flying the new routes without his assistance. It is obvious that top management ignored organizational standards for safety, sending a message that trickled down to the rank and file, that maintaining a tight schedule in the new operations was a priority above all else.

Case 2: Ground Spoiler Activation In Flight/Hard Landing, ValuJet Airlines Flight 558

On January 7, 1996, at 4:20 PM CST, a ValueJet Airlines, Douglas DC-9, impacted the runway at Nashville International Airport in Tennessee, causing substantial damage to the aircraft and injuring several passengers and cabin crew (NTSB, 1996). The accident occurred on the third leg of the day for the DC-9 flightcrew. This was their first flight together.

This flight departed Atlanta's Hartsfield Airport at 3:39 PM, where it was snowing at the time. The captain performed the preflight inspection and did not note any anomalies with the aircraft, more specifically, with the nose strut; however ValuJet did not have specific cold weather operation procedures regarding nose strut inspection. The pilots reported they were concerned that the aircraft's surfaces and components would become contaminated due to the amount of ice and snow they encountered during taxi to the runway. After a normal takeoff, the captain attempted to raise the landing gear lever, but it would not move beyond the uplock check position. The captain employed the troubleshooting methods supplied in the FAA-approved ValuJet Quick Reference Handbook (QRH) and determined there was a landing gear anti-retract mechanism malfunction. In accordance with the procedures in the QRH, the pilots were able to get the landing gear retracted. The captain assumed the flying duties from the first officer, and requested that the first officer review the QRH to verify all required procedures had been accomplished, which the first officer confirmed.

After climbing through 4000 feet and advancing the throttles, the take off warning horn sounded and the cabin did not pressurize. Upon referring to the QRH again, the flightcrew determined that in addition to the landing gear anti-retract mechanism malfunction the ground shift mechanism most likely malfunctioned. The QRH advised pulling the ground control relay electrical circuit breakers to place the circuits in flight mode. After this was accomplished the crew returned to flight procedures without further incident.

After the aircraft was set on autopilot, the pilots discussed the problems they encountered and their options. The pilots did not contact ValuJet's system operations/dispatch to report the irregularities as is stated in the company's operating manual, believing they had resolved the problem and that ice and snow picked up during their ground run caused the problem. They continued on to Nashville believing the aircraft was flying safely and normally, and planned to have contracted maintenance personnel in Nashville examine the aircraft after landing.

Upon normal approach to land at Nashville, at about 100 feet above the runway, the captain reset the ground control relay electrical circuit breakers. After this the cabin outflow valve moved to the full open position and the ground spoilers deployed causing the aircraft to descend at an

excessive rate. The pilots attempted to arrest the descent but struck the runway approach lighting area, tail first. After impact the nosewheel tires and rims separated and the airplane became airborne again. The crew immediately established a climb and performed a go around procedure. They lost radio contact with the ground and exercised emergency procedures to return to the airport to land. ATC alerted the airport rescue and firefighting personnel to the runway. At approximately 4:28, the aircraft touched down on the runway on its main landing gear. The pilots noticed a grinding noise as the nose gear touched down and dug a groove in the asphalt, which continued until the aircraft stopped.

While review of this accident shows fair crew coordination and authority over the flight, especially considering this was the pilot and first officer's first flight together, factors with the organization's management of training and written materials ultimately contributed to the outcome in this accident. The organizational safety issues involving inadequate training and inadequate operations manuals played a key role in how the pilots assessed the situation and considered their alternatives.

ValueJet's QRH differs from McDonnell Douglas' Aircraft Operations Manual (AOM) procedures for a landing gear anti-retract mechanism malfunction, particularly with the resetting of the pulled circuit breaker. Table 2 shows the procedure associated with each text.

Table 2. A comparison a ValueJet and McDonnell Douglas' approved procedures.

ValuJet's QRH (NTSB, 1996, p. 3)		**McDonnell Douglas' AOM** (NTSB, 1996, p. 151)
Approach and Landing:		
ANTI-SKID SWITCH (before 30 kts)	OFF	On the next landing, during roll out (above approximately 30kts.) momentarily release brakes and place the anti-skid switch to OFF and operate brakes manually.
GROUND CONTROL RELAY C/Bs (if pulled) (H20 and J20)	RESET	Reset ground control relay circuit breakers during taxi and verify the electrical circuits (auto pressurization, air conditioning, ground blowers) are in ground mode.

McDonnell Douglas' notation to reset the ground control relay circuit breakers *during taxi* is a discerning factor between the premature resetting of the circuit breakers and the chance it might not have occurred. While the positioning of the reset item in ValueJet's QRH assumes the aircraft is on the ground, it does not indicate that this function should not be performed at anytime. This draws in to question the adequacy of Crew Resource Management (CRM) training in two ways, the crew possessed inadequate understanding of the aircraft's systems and their effects on other systems; and failed to employ other resources available, such as McDonnell Douglas' AOM, or

in-flight maintenance advice, even though they had sufficient time to do so.

CRM is also called into question because the flightcrew never notified the cabin crew about the disposition of the aircraft before or after the go around. Thus, the cabin crew and passengers were not prepared for emergency operations in the case of a hard landing. Table 3 illustrates the organizational factors contributing to the accident.

Table 3. Organizational factors for Flight 558.

Training/Information	Inadequate pilot training. Inadequate CRM training. Inadequate operations manuals. Inadequate maintenance manuals. Specifically winter operations nosegear shock strut servicing procedures.
Communications	Flightcrew/flight attendants/ operations/dispatch/air traffic control.

In this case, the lack of adequate crew training and the lack of appropriate materials led to the mishap. Had the airline had adequate standards in place for preflight inspection, the under inflated nosewheel strut may have been noticed. Had the crew received adequate CRM training, they may have utilized their resources in a more appropriate manner, calling on maintenance operations for advice and thoroughly understanding the problem they were facing. However the lack of administrative procedure led the crew to believe they were operating within safe bounds and that the flight was within normal operating limits.

Organizational Factors: A Review of Accident Data

Although case studies provide a detailed analysis of organizational factors that contribute to a particular accident, they do not provide data concerning the frequency or importance of such factors in general. Therefore, we also conducted an analysis of organizationally based accidents in aviation operations using data provided by the National Transportation Safety Board (NTSB). Specifically, we studied U.S. commercial aviation accidents attributable to human/pilot error, with organizational (airline) cause factors for a ten-year period beginning January 1990-January 2000. A set of 60 accidents was selected based on these criteria for this review (see Table 4). It bears noting that accidents relating organizational factors associated with maintenance facilities and maintenance issues were not included for the purpose of this analysis.

Table 4. Type of operation associated with 60 organizational related accidents, 1990-2000.

Flight Operated	**Frequency**	**Percent**
121 Scheduled	14	23%
121 Non Scheduled	3	5%
Part 121 Total	**17**	**(28%)**
135 Scheduled	10	17%
135 Non Scheduled	33	55%
Part 135 Total	**43**	**(72%)**

Of the 60 accidents, 73% produced fatalities or injuries (see Table 5 for a breakdown of injury)**.** Seventeen occurred in Federal Aviation Regulation (FAR) Part 121 aviation operations, while 43 occurred in FAR Part 135 aviation operations (Table 4). FAR Part 121 operations are the large air carrier domestic or flagship operators, typically referred to as the "major" airlines. FAR Part 135 operations are the commuter and on demand operators, involving smaller aircraft or helicopters, and are frequently referred to as regional, air taxi operations, flying service, or even "puddle jumpers." Each certification involves a designation that is either scheduled, with known flights and operating timetables, or non-scheduled, "on demand," charter type operations. When broken down into the type of hauling operation these accidents represent under each certificate of operation, passenger-only operations make up the largest category of accidents (7 Part 121 Scheduled, 8 Part 135 Scheduled, 21 Part 135 Non-scheduled), followed by cargo-only operations (2 Part 121 Scheduled, 3 Part 121 Non-Scheduled, 11 Part 135 Non-Scheduled) and passenger/cargo combined operations (5 Part 121 Scheduled, 2 Part 135 Scheduled, 1 Part 135 Non-Scheduled).

Table 5. Degree of injury sustained from 60 commercial aviation accidents with organizational cause factors, 1990-2000.

	Frequency	**Percent**
None	16	26.7
Minor	8	13.3
Serious	7	11.7
Fatal	29	48.3
Total	60	100.0

Assessing the assigned findings for the accident sequence of events led to a more comprehensive analysis of the organizational factors. Specifically, the 60 accidents were associated with 70 organizational factors as identified by the NTSB during the original investigation. Based on both the descriptors provided by the NTSB and a review of the narratives associated with each factors, we were able to cluster these organizational factors cluster around 10 broad categories:

- Inadequate procedures or directives (21%),
  Ex: Ill-defined or conflicting policies, formal oversight of operation

- Inadequate initial, upgrade, or emergency pilot training/transition (18%),
  Ex: Opportunities for training not implemented or available, human resource problem

- Inadequate surveillance of operations (13%),
  Ex: Organizational climate issues, chain-of-command, quality assurance and trend information

- Insufficient standards/requirements (12%),
  Ex: Clearly defined objectives, adherence to policy

- Inadequate information sharing (untimely or insufficient) (12%),
  Ex: Logbooks, updates, weather reports

- Inadequate supervision of operations on the management level (10%),
  Ex: Failure to provide guidance, oversight, leadership

- Company/management induced pressure (6%),
  Ex: Threats to job status, pay

- Faulty documentation (4%), and
  Ex: Inaccurate checklists, signoffs, record keeping

- Inadequate substantiation process (1%).
  Ex: Well-defined, verified process, accountability, standards of operation, regulation, recording/reporting process

- Inadequate facilities (1%)
  Ex: Failure to provide adequate environmental controls, lighting, clearance.

When these organizational cause factors are considered in relation to operational category (Table 6), a clearer picture of the elements related to aviation operations emerges. Accident factors related to Inadequate Organizational Procedures emerge prominently in both Part 121 and Part 135 operations, with 7 instances (9.5%) in Part 121 and 8 instances (11.5%) in Part 135 operations. The factors associated with Inadequate Training are significantly higher in Part 135 operations (16%), than in Part 121 operations (3%). Inadequate surveillance of operations also ranks higher in Part 135 operations (10.5%) than in Part 121 operations (3%), as do inadequate standards/requirements at 9% and 3%, respectively. Inadequate information sharing ranks higher in Part 121 accidents (7%), than in Part 135 operations (4.5%). Accident factors associated with inadequate supervision,

which includes management oversight, are present in Part 135 operations (10.5%) but not in Part 121 operations, as are factors associated with company-induced pressure (6%) and inadequate facilities (1.5%).

Table 6. Cross-tabulated breakdown of 70 organizational contributing factors to 60 commercial aviation accidents 1990-2000.

	Part 121 Scheduled	Part 121 Non-scheduled	Part 135 Scheduled	Part 135 Non-scheduled	TOTAL
Procedural	**8%** (6)	**1.5%** (1)	**1.5%** (1)	**10%** (7)	**21%**(15)
Training	**3%** (2)		**12%** (8)	**4%** (3)	**18%**(13)
Surveillance	**1.5%** (1)	**1.5%** (1)	**1.5%** (1)	**9%** (6)	**13%** (9)
Standards	**3%** (2)		**3%** (2)	**6%** (4)	**12%** (8)
Information	**4%** (3)	**3%** (2)	**1.5%** (1)	**3%** (2)	**12%** (8)
Supervision			**1.5%** (1)	**9%** (6)	**10%** (7)
Pressure				**6%** (4)	**6%** (4)
Documentation	**3%** (2)			**1.5%** (1)	**4%** (3)
Substantiation	**1.5%** (1)		**1.5%** (1)		**3%** (2)
Facilities				**1.5%** (1)	**1.5%** (1)

Percentages are approximate and may not sum to 100% due to rounding error.

How these factors play a role in each of the accidents in this study is outlined in Table 7 which summarizes the organizational issues associated with each accident.

Table 7. Overview of organizational cause factors in 60 commercial aviation accidents, 1990-2000.

Accident	Organizational Factors
ANC90FA027 Accident occurred 1/15/1990 Anchorage, Alaska FS Flying Service Beech BE-18 Non scheduled, Part 135	Weights of cargo shipped to the company were not checked prior to aircraft loading. As a result, the aircraft received substantial damage when it rolled to the left after takeoff and the pilot forced a landing with the gear retracted. **The inadequate supervision of the company/operator was cited as a factor in this accident.**
ANC90LA090A and ANC90LA090B Accident occurred 6/17/1990 Taku Lodge, Alaska Taku Glacier Air, Inc Cessna CE-206-U206 Non-scheduled, Part 135	Two aircraft from the same operator were conducting glacier sight seeing operations when a midair collision occurred. Failure of the pilot of aircraft 1 to see and avoid the collision from behind aircraft 2, and **the failure of company management to establish adequate separation procedures** were factors in the collision. Both aircraft landed safely.
ANC92LA090 Accident occurred 6/10/1992 Polk Inlet, Alaska CRI Helicopters McDonnell Douglas MD-500D Non-scheduled, Part 135	The pilot failed to follow the proper verbal procedure for exiting the helicopter while the rotor blades were turning, which led to a tail strike. The pilot examined the tail rotor and saw no damage, electing to fly back to his base of operations. During the flight the tail rotor drive shaft separated, resulting in ditching the helicopter in the water. **There was no information (procedure) in the company operations manual nor the training manual indicating what action to take** after a blade strike has occurred.

ANC93FA012 Accident occurred 11/06/1992 Montague Island, Alaska Trail Lake flying Service, Inc. Cessna CE-207 Non scheduled, Part 135	The pilot intentionally departed in poor visibility along mountainous terrain. The weather was 400-600 foot ceilings with approximately 1-mile visibility in fog (below safe operation minimums**). The company chief pilot was at the same departure point and failed to exercise adequate supervision over this pilot**. The accident pilot's employment record revealed a history of accidents and falsified logbooks. He had also been terminated from a previous flight job for flight in weather below safe minimum operation.
ANC93FA050 Accident occurred 4/3/1993 Nome, Alaska Ryan Air Service, Inc. Cessna CE-207 Scheduled, Part 135	The airplane impacted flat snow covered terrain in a steep left wing down attitude. The weather was poor. Visual flight reference flight was not recommended. The pilot chose to fly, restricted to visual flight reference only. The crash sight was 4 miles from departure point. **The pilot had just returned from suspension. The principal operations inspector did not discuss his earlier accident or the pilot with operator's management and failed to correct the problem. The inadequate supervision of the pilot by the company** was cited as a factor in this accident.
ANC93FA123 Accident occurred 7/20/1993 Denali, Alaska K2 Aviation Cessna CE-185-A185F Non-scheduled, Part 135	After departing a glacier the airplane's engine quit due to fuel starvation. The fuel cap appeared to be loose while the plane was on the ground, and one tank was determined to be empty. The pilot, along with the company senior pilot, decided to see how much fuel the airplane contained in straight and level flight; after which the pilot would determine a course of action. Three minutes after takeoff the engine quit. **A factor in this accident was pressure by the management personnel**.
ANC93LA096 Accident occurred 6/18/1993 Juneau, Alaska L.A.B. Flying Service, Inc. Piper PA-32 Non scheduled, Part 135	The pilot, who was on a visual flight plan, made an emergency landing on a glacier. He had lost sight of the company airplane he was following through a mountain pass and flew into instrument conditions. **The company was cited as having inadequate procedures concerning mountain operations such as minimum weather operations, mountain operations or mountain pass operations.**
ANC94FA100 Accident occurred 8/7/1994 Kodiak, Alaska EPIA DHAV-DHC-2 Non-scheduled, Part 135	The pilot continued to fly in conditions not suitable for visual flight referencing (VFR). **The inadequate procedures/directives by company management concerning continued VFR in marginal weather conditions and fog were related causes of the plane crash into the mountain**. The pilot flew only an estimated 60' above the water and was still in clouds at the time of the accident.
ANC94LA126 Accident occurred 8/31/1994 Cape Sabine, AK Alaska island Air, Inc. Cessna CE-208, Caravan Non scheduled, Part 135	The pilot used non-authorized equipment (GPS) and procedures for an instrument approach. The airplane struck a wing on the ground during a first attempt to land. The airplane subsequently landed with help from the passenger, after 2 more approaches. **The company allowed this flight in violation of operational specifications,** which do not authorize flight in instrument conditions for this airplane for more than 15 minutes, providing visual conditions could be reached and maintained until the destination.
ANC95LA034 Accident occurred 3/10/1995 Ketchikan, AK Ketchikan Air Service, Inc. Cessna CE-207-A Scheduled, Part 135	The aircraft contacted trees during a flight that took place in poor weather. The pilot's continued use of visual separation from terrain, rather than instrument flight procedures was a factor in the tree contract. **Failure of dispatch and the director of operations to follow specified procedures in the company operations manual regarding cancellation of flights due to weather, were contributing causes.**

ANC95LA050 Accident occurred 5/08/1995 Dillingham, AK Peninsula Airways, Inc. Piper PA-31 Non scheduled, Part 135	The pilot was dispatched to a remote landing strip to pick up an unknown number of passengers. He subsequently had to estimate the gross weight of the airplane with 5 passengers and baggage. **The pilot had no information available in the pilot operating handbook regarding operations on a surface other than a level hard surface.** The soft, up sloping runway was too short for takeoff operations given the maximum loading of the aircraft. The landing gear was damaged during takeoff when it struck a snow bank, necessitating a gear-up landing at the destination airport. **Failure of dispatch procedures, lack of support, and company management were cited in this accident.**
ANC97FA097 Accident occurred 7/3/1997 Skagway, AK FGHA, Haines Airways Inc. Piper PA-32 Non-scheduled, Part 135	The aircraft was on approach to land when the engine failed. The area had no suitable terrain for an emergency landing, so the pilot ditched the plane in the water. Only one life vest was used as the passengers and pilot exited the plane into the water. **Insufficient company standards/procedures regarding access to life vests and the pilot's inadequate briefing** to the passengers caused 4 out of the 5 passengers to lose their life after surviving the emergency landing.
ANC98MA008 Accident occurred 11/08/1997 Barrow, AK Hageland Aviation Services, Inc. Cessna CE-208, Caravan Scheduled, Part 135	The pilot, who was also the station manager, improperly directed a new employee, who had only been employed one day, to fill the airplane's left wing only with fuel. Additionally, in violation of federal regulations, the pilot did not deice the aircraft, which had a glazing of ice on the wings and frost on other surfaces. The pilot was in a hurry to depart on time. The aircraft turned into the heavy wing on departure and descended (stall/spin) vertically into the water**. It was noted that lines of authority were not well defined at the airline, and procedures were rarely followed**.
ANC99FA073 Accident occurred 6/9/1999 Juneau, AK Coastal Helicopters, Inc. SNIAS AS-350-BA Non-scheduled, Part 135	The pilot continued the scenic flight into known adverse weather, became spatially disoriented and impacted terrain resulting in 7 fatalities. **The company had a history of pressuring pilots to continue tours in bad weather. The company was also noted as having inadequate certification. Factors in this accident were also related to company hiring and training policies, and hiring an inexperienced pilot with a lack of instrument time.**
ATL92MA118 Accident occurred 6/08/1992 Anniston, AL GP Express Airlines, Inc. Beech BE-99 Scheduled, Part 135	The first day on duty for both pilots in a start up operation in a new region. Both pilots had never flown together previously. The pilots believed they were receiving radar services from Air Traffic Control. They lost awareness of their position and erroneously followed what they believed was the right instrument approach to landing. They continued a controlled descent until impacting terrain. **The airline failed to provide approach charts and establish stabilized approach criteria. In addition, the airline also failed to provide adequate training and support for startup operations in a new region.**
ATL93FA028 Accident occurred 11/25/1992 West Columbia, SC Grand Strand Aviation, Inc. Beech BE-58 Non scheduled, Part 135	The airplane's glideslope was inoperative while at a remote location. Attempts to have it repaired were taking too long. The pilot telephoned operations to intercede with the avionics shop. Subsequently, no repairs were made and the pilot proceeded to fly his normal schedule with known deficiencies in equipment. The pilot attempted an instrument landing. After an improper descent, the pilot did not perform a missed approach and crashed one mile beyond the runway. **A factor contributing to this accident was the airline's failure to monitor the pilot and the maintenance of the airplane.**
ATL94FA075 Accident occurred 4/6/1994 Smithville, TN Tennessee Air Corp Inc. Piper Pa-32RT-300 Non-scheduled, Part 135	The flight departed Nashville for Knoxville and the pilot continued to ask for weather briefings. He encountered ice 45 minutes into the flight and requested a descent to a lower altitude. The pilot requested to descend lower until he was off the radar, subsequently impacting terrain. The pilot's failure to obtain recent weather information to avoid flight into icing conditions and **management induced pressure** were the probable causes of the accident. **Pilots were threatened with punitive action if they refused to fly in questionable weather or to fly questionable aircraft.**

BFO94FA032 Accident Occurred 1/26/1994 Newton, OH Cape Central Airways, Inc. Beech BE-58 Non scheduled, Part 135	The pilot failed to maintain control of the airplane after becoming spatially disoriented in dark night instrument meteorological conditions. The pilot lacked experience in the type of operation flown, and lacked recent instrument time. **Neither the chief pilot nor the airline verified the pilot's qualifications before the flight,** which was the pilot's 4th or 5th in single pilot air taxi operations.
CHI92FA104 Accident occurred 3/05/1992 Freeland, MI Airborne Flying service, Inc. Cessna CE-414 Non scheduled, Part 135	The pilot failed to supervise the loading of a passenger and gear onto an air ambulance flight. During loading the aircraft tipped onto its tail. The tail bumper was forced up into the belly of the airplane's empennage. The pilot refused the offer to have a mechanic look at it and said it had happened before. Once airborne, the pilot radioed that his ailerons were jammed. He subsequently crashed. There was no approval record for the installation of a stretcher or oxygen bottle in the aircraft. **There was also no record of the aircraft's weight and balance with the stretcher installation.**
CHI93LA070 Accident occurred 1/11/1993 Susank, KS Central Airlines, Inc. Gulfstream GA-500-B Non-scheduled, Part 135	Moderate to severe icing at the destination was reported. The pilot informed dispatch and the chief pilot. The consensus was that the weather had not developed as the forecast stated. **The pilot continued flight into the adverse weather, as the owner represented the aircraft as meeting the requirements for flight into icing conditions, which it did not.** Due to flight into icing conditions, ice built up on the plane's surfaces. The pilot issued a missed approach because he was unable to locate the airport; however, the plane was unable to climb and it settled to the ground under full power off the airport.
CHI93MA061 Accident occurred 1/02/1993 Hibbing, MN Northwest Airlink SAAB SF-340-A Scheduled, Part 135	The captain decided not to remove ice from the wings in flight when asked by the first officer, stating that the airplane was going to the hangar after the flight and he would do it on the ground. As a result of ice on the wings, the first officer could not maintain a proper descent in to the airport. The captain reacted too late on the descent taking over the controls and the aircraft was severely damaged upon landing. **The airline failed to assure both pilots had received current Crew Resource Management training and failed to provide adequate training on the airplane's flight characteristics and handling techniques under conditions of wing ice contamination.**
CHI94FA039 Accident occurred 11/15/1993 Chicago, IL Continental Airlines, Inc. Boeing B-727-227 Scheduled, Part 121	During an approach to landing, the crew experienced numerous genuine and "phantom" traffic alerts. The crew's inability to follow checklists during a busy time and unfamiliar warnings pressured the crew into a mistake. **Inadequate company system's training and lack of familiarizing the crew with the specific warning system in the aircraft were factors in this accident.**
CHI95LA053 Accident occurred 12/08/1994 Kansas City, MO Cape Central Airways, Inc. Beech BE-18 Non scheduled, Part 135	The pilot failed to maintain adequate airspeed on final approach due to ice accumulation on the airframe and wings, resulting in an inadvertent stall/spin. The deicing equipment aboard the airplane was in the "off" position. **The airline and chief pilot were cited as providing inadequate training in icing conditions. The chief pilot was also called into question for inadequate surveillance of flight operations, having signed the pilot's logbook for a check ride, when it was determined later that the chief pilot was not available to have given a check ride on that date.**
DCA91MA019 Accident occurred 1/30/1991 Beckley, WV USAIR Express BAC BA-Jetstream-3101 Scheduled, Part 135	**The airplane was allowed into service with an inoperative deicing system, which was required for flight into known icing conditions, which were present that day.** During the flight, the pilots did not request weather updates. The airplane encountered icing during descent. As a result, the airplane stalled and was seriously damaged upon impact. **The airline was cited as providing inadequate training to their pilots concerning cold weather operations.**

DCA91MA021 Accident occurred 2/17/1991 Cleveland, OH Ryan International Airlines Doug DC-9-15 Scheduled, Part 121	The failure of the flightcrew to detect and remove ice contamination on the airplane's wings, which was largely a result of a lack of appropriate response by the FAA, Douglas Aircraft Company, and Ryan international Airlines to known stall characteristics with minute ice accumulation. **The operator also had no requirement for preflight of aircraft. The pilots were not given training regarding the effects of wing (ice/snow) contamination.**
DCA91MA031B Accident occurred 4/4/1991 Marion, PA Lycoming Air service Piper PA-60-601 Non-scheduled, Part 135	**The pilots were not properly trained in aircraft systems, nor were the company's emergency procedures adequate.** After questioning gear extension, which was confirmed by the air traffic control tower, the pilots accepted an offer of a nearby helicopter for a closer look. None of the pilots had training for flight in close proximity. The two aircraft collided and crashed into the ground.
DCA92MA025 Accident occurred 3/22/1992 Flushing, NY USAIR, Inc. Fokker F-28-MK4000 Scheduled, Part 121	Before takeoff, the aircraft had been deiced twice, however, the elapsed time from the last deicing was longer then the recommended holdover time for the deicing fluid. The plane began takeoff at a speed slower than normal lift-off speed, stalled, then came to rest partially inverted and submerged in the bay. **At the time of the accident, the operator did not require specific exterior inspection for ice contamination, and no procedures were in place for departure delays in conditions conducive to icing.**
DCA92MA040 6/19/1992 Meadview, AZ Adventure Airlines Cessna CE-402-C Non-scheduled, Part 135	Failure of the pilot to follow the emergency procedure and the **lack of company training concerning aircraft performance in high density altitude, heavy gross weight, and emergency conditions** led to the aircraft impacting the ground in a flat attitude after a dive to the ground during a descent.
DCA94MA022 Accident occurred 12/01/1993 Hibbing, MN Northwest Airlink BAC BA-Jetstream Scheduled, Part 135	During an approach to land the captain did not start the descent at the appropriate time, which led to an excessive descent rate causing the flight crew and captain's loss of altitude awareness. The plane then collided with trees and terrain. The captain's actions led to a breakdown in crew coordination, loss of altitude awareness by crew. T**he failure of company to adequately address deficiencies in airmanship and crew resource management of captain were cited as factors. Failure of the company, to correct widespread unapproved instrument approach procedures was also a factor in the accident.**
DCA94MA027 Accident occurred 1/7/1994 Columbus, OH United Express BAC BA-Jetstm-4101 Scheduled, Part 135	On the approach to land the aircraft's speed was too slow and the flightcrew's reaction to the stalling aircraft was not correct, nor was it fast enough to save the plane from crashing into a concrete manufacturing plant. The flightcrew's inexperience and lack of knowledge for an approach to landing in a glass cockpit were the main causes of the crew's inappropriate reaction to the stall. **A letter of agreement between the company and its pilots exacerbated the flightcrew's inexperience with glass cockpit and absence of procedural discipline. The company failed to provide adequate approach criteria and training. The company also failed to provide adequate crew resource management training.**
DCA94MA065 Accident occurred 7/2/1994 Charlotte, NC USAA Doug DC-9-31 Scheduled, Part 121	During the approach to land, the flight crew encountered severe convective activity. Shortly after the missed approach to landing the airplane collided with trees and a private residence. Lack of adequate windshear information **and inadequate remedial action by the company to ensure adherence to standard operating procedures** resulted in the pilots' erroneous decision to continue the flight.

DCA95MA006 Accident occurred 12/13/1994 Morrisville, NC American Eagle Bac BA-Jetstream-3201 Scheduled, Part 135	The captain associated the illumination of the left engine ignition light as left engine failure, which was not the case. The pilot's improper assumption and failure to follow approved procedures for engine failure contributed to the cause of the accident**. The company failed to identify, document, monitor and remedy deficiencies in pilot performance and training.**
DCA96MA029 Accident occurred 12/20/1995 Jamaica, NY Tower Air Boeing B-747-136 Scheduled, Part 121	The captain failed to reject takeoff in a timely manner when excessive nosewheel steering tiller inputs resulted in a loss of directional control on a slippery runway**. Inadequate operating procedures developed by airline contributed to the cause of the accident.**
DCA97LA027 Accident occurred 2/6/1997 Saint Johns, Antigua American Airlines, Inc Airbus A-300 Scheduled, Part 121	The captain failed to establish and maintain a stabilized approach, or perform a go-around, and applied excessive pitch rotation during the subsequent recovery from a bounced landing, resulting in a tail strike. **A factor contributing to the accident was the operator's inadequate approach procedures.**
DCA97MA059 Accident occurred 8/7/97 Miami, FL FINE Airlines, Inc. Doug DC-8-61 Non-scheduled, Part 121	The airplane crashed after takeoff from Miami International due to misloading. Failure of ground crew to load aircraft as specified by the airline and **the failure of company to exercise operational control over cargo loading process** were the main two reasons for the crash.
FTW96FA118 Accident occurred 2/19/1996 Houston, TX Continental Airlines, Inc. DOUG DC-9-32 Scheduled, Part 135	The captain's decision to continue the approach contrary to airline standards, and the flightcrew's failure to properly complete the in-range checklist, resulted in the gear up landing due to lack of hydraulic pressure**. A probable cause of the accident was the airline's lack of standard operating procedures.**
FTW98FA273 Accident occurred 6/17/1998 Denver, CO UAL Boeing B-737-322 Scheduled, Part 121	As the plane was pushed back from the gate it collided with a catering truck behind it. **Factors include airline's inadequate pushback procedures.**
FTW98LA353 Accident occurred 7/27/1998 Telluride, CO America West DeHavilland DH-8-202 Scheduled, Part 121	During a pre-start preparation, while parked on a 2-degree up-slope, the aircraft jumped the nose wheel chocks and rolled backwards into another parked aircraft. **The company's inadequate operational procedures were contributory to the cause of the accident.**
IAD96LA052 Accident occurred 3/20/1996 Wilmington, OH Airborne Express Doug DC-8-62 Non scheduled, Part 121	The pilot in command's inadequate visual lookout and the **company/operator's inadequate crew/group coordination and communication during taxi and snow removal operations were factors in this accident** which involved a plane running into a snowplow while taxiing. The weather was one-mile visibility in snowy fog.
LAX90FA252 Accident Occurred 7/12/1990 Pinon, AZ Sky Cab Cessna Ce-210-T210N Non-scheduled, Part 135	The pilot failed to attain the proper touchdown point during landing, Her delay in aborting the landing, and her failure to remain clear of obstacles caused her to crash after contact with power lines. A factor in this accident was the pilot's lack of experience in this type of operation. **Inadequate surveillance by the company was also cited as a cause of the accident.**

LAX90FA331 Accident occurred 9/21/1990 Flagstaff, AZ P.M. Air Piper PA-31-350 Non-scheduled, Part 135	The pilot received a special visual flight reference clearance. He contacted high voltage transmission wires and plunged to the ground. **The failure of operator and dispatch to provide current weather** and the pilot's poor judgment in initiating the flight given the existing weather conditions were the probable causes of the accident.
LAX92MA184 Accident occurred 4/22/1992 Makawao, HI Scenic Air Tours Beech BE-18-E18S Non-scheduled, Part 135	The aircraft crashed into terrain during an island tour. The captain's decision to continue visual flight into instrument/cloud conditions that obscured rising mountainous terrain and his failure to properly use available navigational information to remain clear of the terrain were causes in the accident. **The company also failed to conduct substantive pilot pre-employment background screening.** The captain had falsified his pre-employment records.
LAX93FA316A Accident occurred 8/7/1993 Tusayan, AZ Papillion Airways, Inc. Bell GHT-206-L1 Non-scheduled, Part 135	One helicopter was landing and made contact with another helicopter stationed on the ground. **The operator failed to provide adequate or recommended safe helipad dimensions**, resulting in the pilot's inability to maintain separation from the main rotor clearance.
LAX95FA079 Accident occurred 1/14/1995 Los Angeles, CA Wolf Air Aviation ltd. Bell BHT-206-B Non-scheduled, Part 135	The helicopter took off in minimum weather and continued at low altitude flight until contacting transmission wires. **The pilot and dispatcher failed to follow established dispatch procedures.**
LAX97FA036 Accident occurred 11/14/1996 Van Nuys, CA AEX Air Cessna CE-310-1 Non-scheduled, Part 135	The pilot failed to maintain a climb following initiation of a missed approach in fog due to spatial disorientation. **The operator failed to provide required training to the pilot who had a history of unsatisfactory instrument flying performance.**
LAX98FA211 Accident occurred 6/25/1998 Lihue, HI Ohana Helicopters AEROSPATIALE, AS350BA Non-scheduled, Part 135	Three helicopters departed on a tour, with about 2 minutes between each departure. While operating under visual flight rules, the accident helicopter encountered instrument meteorological conditions and impacted a mountain. The pilot, who was employed by the operator 2.5-months earlier, was in trail behind the company's most experienced (chief) pilot, and second most experienced pilot. Contributing factors to this accident are the pilot's decision to continue VFR flight into deteriorating weather conditions in mountainous terrain, and **the failure of the chief pilot, who had directly observed the deteriorating weather conditions, to direct the following pilots to avoid the area.**
MIA96FA059 Accident occurred 1/7/1996 Nashville, TN Airtran Airlines, Inc – VJ6A Doug DC-9-32 Scheduled, Part 121	The flight crew's improper procedures and actions in response to an in-flight abnormality resulted in the inadvertent in-flight activation of the ground spoilers during the approach to landing and the airplane's excessively hard impact in the runway approach light area. **The incomplete procedural guidance contained in airline quick reference handbook and checklist,** crews' inadequate knowledge and understanding of aircraft systems and airline's failure to incorporate cold weather nosegear servicing procedures in it operations and maintenance manuals were major causes of the accident.
MIA96LA107 Accident occurred 3/27/1996 Memphis, TN FEDEX Boeing B-727-225 Non-scheduled, Part 121	After landing the airplane came into contact with construction equipment on a closed taxiway. The failure of the flightcrew to maintain clearance from the construction equipment, **the failure of airline operations/dispatch to supply the flightcrew with current airport information and the failure of the crew to receive the information were factors in the accident.**

MIA98FA089 Accident occurred 2/26/1998 Birmingham, AL USAirways Fokker F28 Scheduled, Part 121	The airplane was struck by lightning while flying in precipitation deviating within 10 miles of the edge of a level 5 thunderstorm associated with a squall line. The crew was given convective weather alerts for the central US, which indicated severe thunderstorms over the area. **The airline failed to conduct weather radar training in recurrent, upgrade, or requalification training. The dispatcher failed to provide the crew weather watches that were available 15 minutes before and after the flight departed.**
NYC91FA086 Accident occurred 3/12/1991 Jamaica, NY ATI Doug DC-8-62 Scheduled, Part 121	During takeoff roll the captain was unable to pull the plane off the ground. He aborted takeoff and steered the plane away from traffic on a nearby highway. The plane was destroyed. The flight engineer miscalculated the aircraft's gross weight by 100,000 lbs. and provided the captain with improper takeoff speeds. **Shortcomings in the operator's flightcrew training program and questionable schedule of qualified (marginally experienced) crewmembers were factors in the accident.**
NYC94FA123 Accident occurred 7/13/1994 Atlantic City, NJ EGQA Lear LR-35 Non-scheduled, Part 135	The takeoff was aborted because the pilot could not maintain directional control. The plane did not stop on the remaining runway. Improper maintenance, **incorrect checklist provided to aircrew ("reversed thrusters armed" missing on the checklist), and lack of pilot experience were factors in this accident.**
NYC96FA174 Accident occurred 8/25/1996 Jamaica, NY TWA LKHEED L-1011 Scheduled, Part 121	The flight crew failed to complete the published checklist and to adequately crosscheck each other, resulting in their failure to detect that the leading edge slats had not extended. This caused the tail to contact the runway during the computer-driven, auto-land flare for landing. Inadequate inspection procedures for the slat drive system, and the **operator's inadequate checklist, which did not include having the Flight Engineer monitor the double needle slat gauge were causes of the accident.**
NYC97FA045 Accident occurred 1/10/1997 Bangor, ME USAir Express Beech BE-1900-D Scheduled, Part 135	**Inadequate flight training provided by the operator** led to the pilot's improper decision to abort the takeoff due to a false stall warning horn. The airplane was above the appropriate speed for a stall when the stall warning horn activated. The pilot then landed the plane on the takeoff runway. Improper winter operations had discontinued plowing and runway snow removal. The aircraft crashed into a snow bank on the aborted takeoff.
SEA91FA099 Accident occurred 5/6/1991 Ravensdale, WA Airpac Airlines, Inc. Piper Pa-34-200T Non-scheduled, Part 135	During an approach to land the pilot exceeded the critical speed and stress limits for the airplane, causing the plane to break apart. **A factor relating to the accident was the pilot's hurry to deliver the cargo, which was scheduled for delivery approximately 5 minutes after the time of the accident. A factor relating to the accident was management pressure on the pilot to meet the deadline for the cargo delivery.**
SEA94FA096 Accident occurred 4/3/1994 Lamoille, NV El Aero Services Bell Bht-206-B3 Non-scheduled, Part 135	**Lack of equipment** (snow covers to protect engine intake) and an **improper planning decision by the director of operations** over the radio to the pilot were factors in the loss of power during takeoff, resulting in impact with terrain.
SEA94LA206 Accident occurred 8/6/1994 Salmon, ID Salmon Air Taxi Piper PA-34-200T Non-scheduled, Part 135	During an approach to land the pilot became disorientated and made the wrong decision to continue descent to the runway. He contacted the terrain ¼ mile short of the runway. The pilot had been on duty for 16 hours and had flown 4 flights for a total of 6-1/2hours. The pilot showed signs of fatigue as noted by a passenger. **The operator's inadequate supervision of pilot (fatigue, lack of recent night flying experience) led to the pilot's improper decision.**

SEA95FA170 Accident occurred 8/3/1995 Portland, OR Horizon Air Dornlf –328-100 Scheduled, Part 121	After landing, the aircraft began veering slightly left. The first officer applied rudder for control, then the captain assumed control of the aircraft. The captain realigned the aircraft with the centerline and called for condition levers to minimum. At this time the airplane veered left so sharply that the captain was unable to gain control and the aircraft and collided with a runway sign before going off the runway. **Insufficiently defined steps from operator, and landing/taxi procedures were the probable cause of the accident.**
SEA97FA188 Accident occurred 8/13/1997 Seattle, WA JIKA Beech BE-1900-C Non-scheduled, Part 135	The aircraft was overloaded and improperly loaded, causing a stall/mush condition, resulting from its aft center of gravity. The contractual cargo-loading personnel inaccurately provided aircraft weights to the pilot in command. Severe impact with the ground caused the landing gear to break and led to a post crash fire**. Inadequate company procedures for cargo loading** and the pilot's improper lowering of the flaps in an aft center of gravity location due to the inaccurate information were the causes of the accident.
SEA99LA003 Accident occurred 10/17/1998 Missoula, MT Alpine Aviation Beech BE-99 Non-scheduled, Part 135	The pilot in command's delayed remedial action in response to the co-pilot's improper landing flare, **and the application of the co-pilot's excessive use of trim as taught in the operator's initial aircrew training program caused the aircraft to impact terrain during an attempted abort landing.**

Key: COM = Company/Operator Management; PIC = Pilot in Command

A strong reason for the discrepancy of accident distribution between the operative categories could lie in the range of pilot non-flight duties, which depends on the employment setting. Part 121 airline pilots have the services of large support staffs, and consequently perform few non-flight duties. Pilots employed in other settings, such as Part 135 operations have duties other than flight responsibilities. They may load the aircraft, handle passenger baggage, supervise refueling, arrange for major maintenance, or perform minor aircraft maintenance and repair work. This leads to a blurring of the supervisory chain of command and can put one person in charge of numerous supervisory issues, devoid of checks and balances, which they are not adequately equipped to handle. This may also serve as a contributing factor to the higher rate of inadequate supervisory and surveillance accident factors at the Part 135 operations than at the Part 121 operations.

As airlines grow larger, the problems appear to display tendencies shifting from those of direct supervisory and pressure, to those of a procedural, informational, documentary nature. What this may represent is a drift in the practical application of safety concepts. Normal rote operations may shift from time to time based on the accepted way work is performed. These shifts may also become part of organizational doctrine, as the safety rules for the original procedure become lost in the presence of the current context of work. This conceptual drift appears to contribute to the organizational factors experienced in the larger air carriers where procedural departures from routine become routine in practice in the absence of documentation and information sharing. This may be due to the hierarchical distance between the front line operators and the upper level management where the procedure is substantiated.

An abundance of factors occur toward the top of the organizational chain. Indeed, problems with the organization's procedures were cited in a majority of the accidents studied. The overarching organizational process set by those in charge of establishing the organization's

directives and procedures may come into play that those in charge of setting policy are too far removed from the actual job to adequately address the issues involved. Perhaps it behooves those in charge, in the policy area specifically, to ensure that a more bottom-up organizational approach is utilized to incorporate the expertise of those who actually perform the work with that of those who preside over it.

Conclusions

The case studies and accidents provided here illustrate that accidents with "pilot error" causes can be traced back to supervisory and organizational influences. The purpose of this article is to provide a general overview to the concept of organizational safety factors as they relate to the human factors perspective and to introduce a framework to objectively identify organizational factors as they relate to error. Though this may represent a limited sample of accidents, based on the overall number of accidents, this study represents a thorough analysis of each accident where the organizational factors have been scrutinized, rather than simple trend information. It bears mention that each accident presented here is assessed according to the NTSB's findings of probable cause. Other accidents may meet the criteria of containing organizational cause factors, yet organizational factors in accident investigations have been historically overlooked and thusly not coded as such in the official findings of probable cause. As a result, we have not included them here, thus the number of organizational accidents in commercial aviation may be higher than reported here. Albeit, not all aircrew accidents have organizational causes.

Given organizational factors are identified, interventions aimed at the supervisory and organizational levels of an establishment have the potential to improve the entire system when compared to issues at the operator level, which have the potential to focus on just one error. Valuable resources are better spent on prevention and control at the organizational level, rather than on trying to fix, after-the-fact, the inexhaustible ways people fail at the operational level. With this, we have the potential to eliminate a myriad of errors as versus the proverbial Dutch boy putting his finger in the dam at the operational level, only to find numerous leaks exploding all around.

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